

# **Dynamic Instabilities of Dislocation Lines Due to Wetting Nuclei of a Different Crystal Phase**

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The glide motion of a dislocation line under an external stress is considered in a crystal, undergoing a first-order phase transition. Within some temperature range around the transition point the dislocation line can be wetted by a cylindrical nucleus of a new phase. This gives rise to a viscous friction force which depends in a nonlinear way on the velocity of the dislocation. As a result a moving straight dislocation line may become unstable with respect to capillary-wave-like shape fluctuations of the line. The effect is similar to the mechanism of spinodal decomposition in an unstable wetting situation.

Within the hysteresis temperature subrange of the crystal phase transition a trail of a metastable phase can nucleate at the dislocation which then leads to a dry-friction force acting on the line. The strength of this force depends on the angle between the Burgers vector and the orientation of the defect line. This fact gives rise to another shape instability which can be considered as a new type of dynamic roughening of the line, initiated e.g. by random point defects. For a quantitative treatment of this effect a Kardar-Parisi-Zhang-like equation of motion for the dislocation line is derived from a bulk model. In case of a gliding screw dislocation the solutions of this equation are expected to lead to a zigzag structure of the line.